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**Before The
Energy and Natural Resources Committee
United States Senate
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Mr. Chairman, members of the Committee, it is a pleasure for me to appear before you today to discuss Senate bills 2323 and 2144.

I intend, first, to survey The Department of Energy's (DOE) overall Carbon Sequestration Research and Development program, our goals and our progress to date. I will then describe DOE's collaboration with the Environmental Protection Agency (EPA) in carbon capture and storage.

Complete knowledge of all these efforts already underway should be of interest as the Senate bills under consideration go forward.

CARBON SEQUESTRATION AND FOSSIL FUELS

The availability of affordable energy is a bedrock component of economic growth. The use of fossil fuels, however, can result in the release of emissions with impacts on the environment. Of growing significance are emissions of carbon dioxide (CO₂) which contribute to global climate change.

Balancing the economic value of fossil fuels with the environmental concerns associated with fossil fuel use is a difficult challenge. Carbon capture and storage

technologies provide a key strategy for reconciling energy and environmental concerns. Geologic sequestration - the capture, transportation to an injection site, and long-term storage in a variety of suitable geologic formations – is one of the pathways that DOE is pursuing to allow the continued use of fossil fuels while reducing CO₂ emissions.

DOE has assumed a leadership role in the development of carbon capture and storage technologies. Through its Carbon Sequestration Program – managed within DOE’s Office of Fossil Energy and implemented by the National Energy Technology Laboratory (NETL) – DOE is developing technologies through which geologic carbon sequestration could potentially become an effective and economically viable option for reducing CO₂ emissions. The Carbon Sequestration Program works in concert with other programs within the Office of Fossil Energy that are developing the complementary technologies that are integral to coal-fueled power generation with carbon capture: Advanced Integrated Gasification Combined Cycle, Advanced Turbines, Fuels, Fuel Cells, and Advanced Research. Successful research and development could enable carbon control technologies to overcome various technical and economic barriers in order to produce cost-effective CO₂ capture and enable wide-spread deployment of these technologies.

DOE’S CARBON SEQUESTRATION PROGRAM

Since DOE’s first investigation into carbon sequestration began in 1997 with a budget of \$1 million, DOE has spent approximately \$483 million through Fiscal Year 2008 (twelve year cumulative total) on further research and development, a powerful sign of the importance of this technology to our energy and environmental future.

The Carbon Sequestration Program, with a Fiscal Year 2008 budget of \$119 million, encompasses two main elements of technology development for geologic sequestration: Core R&D and Validation and Deployment. The Core R&D element addresses several focus areas for laboratory technology development that can then be validated and deployed in the field. Lessons learned from the field tests are fed back to the Core R&D element to guide future research and development. Through its Integrated Gasification Combined Cycle, Fuels, Sequestration, and Advanced Research programs, DOE is investigating a wide variety of separation techniques, including gas phase separation and adsorption, as well as hybrid processes, such as adsorption/membrane systems. Current efforts cover not only improvements to state-of-the-art technologies but also the development of several revolutionary concepts, such as metal organic frameworks, ionic liquids, and enzyme based systems. The ultimate goal is to drive down the energy penalty associated with capture so that geologic sequestration can be done with only a moderate increase in the cost of electricity.

REGIONAL CARBON SEQUESTRATION PARTNERSHIPS

One of the key questions regarding geologic sequestration is the ability to store CO₂ in underground formations with long-term stability (permanence); this requires monitoring and verification of the fate of the CO₂, to ensure that the science is sound and ultimately gains public acceptance. DOE's NETL, with the Regional Carbon Sequestration Partnerships (RCSPs) are developing and validating technology, and national infrastructure needed to implement geologic sequestration in different regions of the Nation.

The RCSPs are evaluating numerous geologic sequestration approaches in order to determine those best suited for specific regions of the country. They are also helping develop a framework to validate and deploy the most promising technologies for geologic sequestration.

A THREE-PHASE APPROACH

NETL's three-phased approach began with a Characterization Phase in 2003 that focused on characterizing regional opportunities for carbon capture and storage, and identifying regional CO₂ sources and storage formations. The Characterization Phase was completed in 2005 and led into the current Validation Phase, which focuses on field tests to validate the efficacy of geologic sequestration technologies in a variety of storage sites throughout the U.S. Using the extensive data and information gathered during the Characterization Phase, NETL identified the most promising opportunities for carbon storage in their regions and commenced geologic field tests. In addition, NETL is verifying regional geologic sequestration capacities initiated in the first phase, satisfying project permitting requirements, and conducting public outreach and education activities.

The third phase, or Deployment Phase, for large-volume testing is intended to demonstrate the feasibility of CO₂ capture, transportation, injection, and storage at a scale comparable to future commercial deployments. DOE has in recent months awarded funds to initiate five large-volume demonstration projects. Depending on the results of a scientific needs assessment being conducted in FY 2008 and the ability of additional project proposals to meet those needs, additional large-scale projects may be initiated. In October, 2007, DOE announced awards totaling \$318 million for two projects with the Plains Carbon Dioxide Reduction Partnership, and one project each with the Southeast

Regional Carbon Sequestration Partnership and Southwest Regional Partnership for Carbon Sequestration. In December, DOE announced a \$66.7 million award for a project with the Midwest Geological Sequestration Consortium.

The geologic structures to be tested during these large-volume storage tests will serve as potential candidate sites for the future deployment of technologies demonstrated in FutureGen and the Clean Coal Power Initiative, which plans to complete a solicitation for carbon capture technologies at commercial scale in 2008.

The NETL, with the RCSPs and the National Carbon Sequestration Database and Geographical Information System (NATCARB), has created a methodology to determine the capacity for CO₂ storage in the United States and Canada and an Atlas from data generated by the RCSPs and other databases, including the United States Geological Survey's (USGS) National Coal Resources Data System, USGS National Water Information System Database, and EROS Database. Based on data displayed in the *2006 Carbon Sequestration Atlas of the United States and Canada*, the aggregate CO₂ sink capacity – including saline formations, unmineable coal seams, and oil and natural gas formations – is estimated to hold several hundred years of total domestic U.S. emissions.

MOVING TOWARD COMMERCIAL DEPLOYMENT

Carbon capture and storage can play an important role in mitigating carbon dioxide emissions under potential future stabilization scenarios. The United States has a large capacity of geologic formations amenable to CO₂ storage. DOE's Carbon Sequestration Program will continue to help move geologic sequestration technology toward readiness for commercial deployment.

EPA's ROLE IN THE DEPLOYMENT OF CARBON CAPTURE AND STORAGE TECHNOLOGY

Complementing DOE's carbon capture and R&D research program is the EPA program for ensuring that underground injection of CO₂ is conducted in a manner that is protective of underground sources of drinking water (USDWs) in accordance with section 1421(d)(2) of the Safe Drinking Water Act (SDWA). EPA is initiating work to develop proposed regulations to ensure consistency in permitting commercial scale geologic sequestration projects. It plans to propose regulations in the summer of 2008. EPA is also responsible for reviewing and commenting on environmental impacts statements under the National Environmental Policy Act (NEPA).

As DOE moves forward with its R&D program and geological storage projects, EPA is focused on: evaluating risks to human health and the environment; providing guidance on permitting CO₂ injection wells for pilot-scale projects; identifying technical and regulatory issues associated with field tests and commercial projects; and developing an appropriate management framework for permitting

DOE-sponsored and industry-sponsored research will help develop data and tools to address these issues. It is anticipated that EPA will aggregate and analyze the information generated from those efforts and initiate new research where there are gaps.

DOE has also sponsored a five-year, two-phase study by the Interstate Oil and Gas Compact Commission (IOGCC), which is reported on in the publication a Model CO₂ Storage Statute and Model Rules and Regulations. The report provides industry perspective on development of regulations governing the storage of CO₂ in geologic

media and an explanation of those regulatory components. EPA will consider these and other viewpoints in its regulatory development process.

PROGRAM COORDINATION

EPA coordinated with DOE in the preparation of its research plan, and is working closely with DOE, state regulators and other stakeholders on all geological storage activities so as to leverage resources, clarify key questions and data gaps, and ensure that work is complementary and not duplicative.

EPA and DOE, for example, hold quarterly coordination meetings (at both the staff and managerial level) to share progress and discuss key issues.

EPA, in coordination with DOE, organized a series of technical workshops in 2007 to help define future research needs. The workshops were focused on technical issues that need to be addressed in order to design, operate, and permit CO₂ injection wells. Attendees included EPA and state regulators, DOE project managers, and DOE-funded researchers.

In addition, EPA has and will continue to be involved in major DOE/NETL activities such as the National Conferences on Carbon Sequestration and the Regional Partnership Annual Review Meetings.

S. 2323: CARBON CAPTURE AND STORAGE TECHNOLOGY ACT OF 2007

The U.S Government, DOE and other agencies, the 50 states, several Canadian provinces, private industry, environmentalists, and scientists and engineers have expended great efforts, invested heavily and made remarkable progress over the last decade in understanding and preparing for an energy and environmental future in which carbon sequestration technology will play an integral role.

The Administration strongly supports research and development of carbon capture and storage technology as a solution to reduce carbon dioxide emissions and address global climate change. The Administration is currently performing the research and development needed to successfully develop this technology. DOE has numerous initiatives looking at decreasing the cost of carbon dioxide capture and proving the permanence of carbon dioxide storage in geologic formations and has success with its current structure. DOE believes that the research, development and demonstration projects prescribed in Sections 3, 4 and 6 of Senate Bill 2323 are generally duplicative of the R&D and demonstrations underway in our existing program. DOE is currently evaluating some of details of this bill within the context of its existing program, such as the use of competitive grants to fund commercial demonstration of carbon dioxide sequestration and the number of projects needed.

Section 5 of this bill would require an interagency task force to develop regulations for the capture and storage of carbon dioxide. This task force was officially established last year, and is chaired by EPA, with considerable support from DOE. Therefore, we believe that this section of the bill is also redundant.

For the past 10 years, DOE's Sequestration Program within the Office of Fossil Energy has funded research in areas of carbon dioxide capture, storage, monitoring, mitigations, and verification (MMV), breakthrough concepts, and infrastructure development through its Regional Partnership Initiative. NETL is researching the most suitable technologies, informing regulatory development, and evaluating infrastructure needs for carbon capture, storage, and sequestration in different areas of the country. The RCSPs are conducting much of these efforts, and include 41 states and over 350 distinct

organizations working together for the most cost-effective solutions. Additionally, the Clean Coal Power Initiative and FutureGen are providing the demonstration platform for testing larger carbon dioxide capture methods at power plants. These activities are currently providing the plan forward and should continue along their current path to produce the best results at the earliest time so that this technology can be an important option to cost-effectively reduce greenhouse gas emissions.

S. 2144: CARBON DIOXIDE PIPELINE STUDY ACT OF 2007

This bill would require the Secretary of Energy, in consultation with the Federal Energy Regulatory Commission, the Secretary of Transportation, the Administrator of the EPA, and the Secretary of the Interior to conduct a feasibility study relating to the construction and operation of pipelines and carbon dioxide sequestration facilities, and for other purposes. It also requires that the Secretary provide this report to Congress no later than 180 days after the enactment of this bill. DOE supports this legislation and notes that, although it is the study lead, it will work closely with the other agencies in conducting this study, and in particular with DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA), which will have a leading role in evaluating plans for construction and operation of pipelines for carbon dioxide.

Mr. Chairman, and members of the Committee, this completes my prepared statement. I would be happy to answer any questions you may have at this time.

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